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is greatest in the basal portion, the apical portion continues to grow for very nearly or quite as long. The growth of the flower-stalk of *Pelargonium* he describes, on the other hand, as centrifugal, the growth of each zone ceasing before the one next above it.

With regard to the relative amount of growth by day and by night, Münter also gives no measurements, but states that in the daytime the plant grows at first five times, then four times, and then three times stronger than by night. This differs materially from the general law as stated by Sachs (Text-Book, English edition, page 749), that "the plant will, according to circumstances, sometimes grow more quickly by day, sometimes by night, without exhibiting any exactly recurrent periodicity," the difference, however, being never so great as that stated by Münter. Mr. Bennett's observations are more in accordance with this.

BOTANICAL PAPERS IN RECENT PERIODICALS. — *Comptes rendus*, No. 4. Trécul, Theory of Metamorphosis of Branches for Diverse Functions. Decaisne, Note on *Cedrela Sinensis.* Henneguy, On Reproduction in Volvox. No. 5. Trécul, On *Mentzelia.* J. Joubert and Chamberland, On Fermentation in Fruits kept in Carbonic Acid. Durin, On Cellulosic Fermentation. Béchamp, On the Microzymas of Germinating Barley and of Sweet Almonds, as producing Diastase and Synaptase. No. 6. Renault, On *Neuropteris.*

Flora, No. 22. Weiss, On the Relations of Growth, and the Course of Fibro-Vascular Bundles in *Piperaceæ.* (Continued also in Nos. 23 and 25.) No. 23. De Thümen, Fungi of South Africa. Nylander, On Certain Lichens in Mr. Wright's Cuban Collection (40 new species). No. 24. Dr. Christ, of Basel, Varieties of *Rosa.* Geheeb, Notes on Mosses.

Botanische Zeitung, No. 35. H. Hoffmann, Experiments in the Cultivation of Varieties. (Continued in No. 36.) V. Vesque-Püttlingen, On the Periodicity of the Currents in Protoplasma.

ZOÖLOGY.

THE PILOT FISH. — Eleven years ago, while on a voyage from India to this country, we were beset by many calms while crossing the "line." On one of these occasions, while some of the passengers were amusing themselves looking over the stern of the vessel, two beautiful pilot fishes (Naucrates?) were seen, and soon after a portion of an unusually large shark. Immediately a hook baited with salt pork was thrown overboard. When it touched the water these pilot fishes were seen to approach it, and then suddenly dart under the vessel. Soon a very large shark appeared and received the bait. As soon as safely secured the sailors drew him on deck. When a suitable opportunity was given for examining him, these two pilot fishes were seen attached to the body. At what particular portion they attached themselves I am unable to state. They were removed and placed in a bucket of salt water, where they swam about as if nothing had happened. — A. H. BURNELL.

A SPIDER FISHERMAN. — Just before the late war I was at Col. Oakley Bynum's spring, in Lawrence County, Ala., near the town of Courtland, where I saw a school of minnows playing in the sunshine near the edge of the water. All at once a spider as large as the end of my finger dropped down among them from a tree hanging over the spring. The spider seized one of the minnows near the head. The fish thus seized was about three inches long. As soon as it was seized by its captor it swam round swiftly in the water, and frequently dived to the bottom, yet the spider held on to it. Finally it came to the top, turned upon its back and died. It seemed to have been bitten or wounded on the back of the neck near where the head joins. When the fish was dead the spider moved off with it to the shore. The limb of the tree from which the spider must have fallen was between ten and fifteen feet above the water. Its success shows that it had the judgment of a practical engineer. — T. M. PETERS. (Communicated by the Smithsonian Institution.)

THE NATURE OF MONADS. — We have additional discoveries regarding the nature of monads by the Russian naturalist, Cienkowski. These organisms are on the border land of the plant world, and in some cases form protoplasmic nets (plasmodia) like the plant *Myxomycetes.* These plasmodia have the function of falling apart into amœba-like forms, which have hitherto been regarded as independent animal organisms; hence he thinks that many Amœbæ do not represent independent forms, but belong to the developmental cycle of other and plant-like organisms. Among the monads, Cienkowski, according to a German correspondent of *Nature*, has observed forms in various stages of encystment, self-division, and formation of colonies. But the most remarkable series of changes were observed in *Diplophrys stercorea*, an extremely small cell-like organism with a yellow spot and pseudopodia at two opposite ends of the body. These little bodies, observed in moist horse-dung, multiply by division, and form by union of the pseudopodia long strings in which separate individuals can glide to and fro. "Thus the boundary lines which it has so long been usual to draw between plant and animal organisms, and between the individual groups of those lowest forms of life, appear more and more illusory, and the supposition is recommended of a common lowest kingdom of organisms, that of Protista (Haeckel), out of which animals and plants have by degrees been differentiated."

MAYER'S ONTOGENY AND PHYLOGENY OF INSECTS.[1] — "Ontogeny" is a term devised by Haeckel, and means the development or embryonic and post-embryonic changes of the individual; "phylogeny" corresponds to its English equivalent, "ancestry," while the present essay is an attempt to explain the origin and ancestry of the six-footed insects (Hexapoda) from embryological and anatomical data. No new facts, so far as we are aware, are presented by the author, whose essay has, apparently, contrary to usage in German universities, been crowned not for the original work it contains but for the ideas suggested by the labors of preceding authors.

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[1] Ueber Ontogenie und Phylogenie der Insekten. Eine akademische Preisschrift. Von Dr. Paul Mayer, in Jena. Jenaische Zeitschrift für Naturwissenschaft. x. heft 2. Jena. 1876. With four plates, pp. 125–221.

In trying to reconstruct the form of the primitive insect, Mayer insists that it should be done from a study of the winged adult or *imago*, "since *a priori* we cannot know how far the form of the larva is original or secondary." Other authors have with better reasons derived the ancestral form from the larva.

Mayer's ancestral insect, then, which he calls *Protentomon*, had a body divided into a head, thorax, and abdomen, the latter consisting of eleven segments, while there were six thoracic feet with five-jointed tarsi, and two pairs of wings, nine (and perhaps eleven) pairs of stigmata, a pair of salivary glands, and four excretory organs or Malpighian vessels, besides a well-developed nervous system, heart, and an aaorta, as usual in existing insects.

This hypothetical *Protentomon* is derived by Mayer from the worms,[1] in opposition to the suggestions of Fritz Müller and Brauer that the insects originated from the Crustacea. This worm (1), the parent of the half a million species of insects which have peopled the globe during the present and past ages, was " an unjointed worm, a common starting-point for the Tracheata and higher worms, and also a near relation of the ancestral form of the Crustacea." This worm then (2) transformed into a higher organism, with eighteen joints to its body and at least fourteen pairs of segmental organs, with perhaps also a masticatory apparatus in the form of jaws; and was perhaps nearly related to the existing Annelids. (3.) A third step towards the insects was a form similar to the second, but with ventral and perhaps also dorsal appendages on all the segments; it was still aquatic. It transformed (4) into a worm with tracheæ and with dissimilar segments (the appendages in part beginning to disappear). It lived in fresh water, and is called by our author *Prototracheas*. (5.) This *Prototracheas* became an *Archentomon*, still aquatic, with six feet, and clearly defined head, thorax, and abdomen. Finally this fifth form acquired two pairs of wings, was terrestrial in its habits, and became (6) a *Protentomon*.

The author then discusses the ancestry of the different orders of insects. It is noticeable that in treating of them he begins with the Hymenoptera and ends with the Neuroptera, following in fact, unconsciously, the reviewer's classification proposed in 1863. The Linnæan Neuroptera are, however, broken up into several orders, the author following the usual German system; but Mayer is the first German author, so far as we are aware, who places the Hymenoptera at the head of the insects, and the Coleoptera in the neighborhood of the Hemiptera and Orthoptera, where they unquestionably belong.

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[1] This view was advocated by the writer (though Mayer does not mention it) in Our Common Insects, chapter xiii., entitled Ancestry of Insects (1873). This is the more inexcusable since Dr. Mayer quotes from the essay.

Mayer adopts the suggestions of Bütschli and Semper that the air-tubes of insects originated from the segmental organs of worms, and, discarding Gegenbaur's view that the air-tubes were at first internal, closed air-sacs, he believes that the stigmata or breathing holes were the first to be formed. It may be objected that as insects are already provided with renal vessels, it is not necessary to suppose that segmental organs (also in part excretory) survived in them, and the inquiry arises whether the air-tubes of insects may not have arisen from the water-vascular system of the lower worms, which communicates with two or more external openings. In framing hypotheses like these, one guess may be as good as another.

The author, in a foot-note, combats with considerable unction our suggestion, made in 1867, that the head of insects consisted of seven segments. It may be observed that at that time we were influenced by the prevailing views of Agassiz, Dana, and others, who regarded the ocelli and eyes as homologues of the limbs. This view was corrected in the Memoirs of the Peabody Academy of Science, ii. 21, 1871 (a work from which our author quotes), and also in several other places, including the Guide to the Study of Insects, third edition, 1872 ; and the view that the normal number of cephalic segments is four was at the same time and in the same places insisted upon.

Dr. Mayer also quotes us as believing that the parts of the ovipositor are not homologous with the legs, a view we suggested in 1866, but after fresh embryological studies retracted in the above-mentioned Memoir in 1871 (which the author seems to have read), and also in other places, notably the essay on the Ancestry of Insects, quoted by Mayer, where the view that the ovipositor of the Hymenoptera, Hemiptera (Cicada), and Orthoptera, as well as the spring of the Thysanura and the spinnerets of spiders, are homologues of the legs is emphasized.

As regards the position of the primitive band of insects, Mayer ignores the remarks of Dr. Dohrn on its significance in classification, and considers that the circumstance whether the primitive band is external or floats within the yolk, is of much importance, laying down the law that "insects with an external primitive streak are in general older than those with an inner." We have previously[1] objected to Dohrn's classification of insects into "ectoblasts" and "entoblasts," and would make a similar objection to Mayer's views, since in weevils (*Attelabus*), abundantly proved by Dr. Le Conte to be the oldest of Coleoptera (a fact ignored by Dr. Mayer, whose genealogical tree of Coleoptera represents the antiquated classification of this order), we demonstrated that the primitive band is external, while in *Telephorus* it is internal, though our observations are called in question by Dr. Mayer, who, however, so far as we know, has never published any observations on the embryology of this or any other animal, the entire essay being based on facts observed by previous writers.

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[1] Embryological Studies on Hexapodous Insects. Memoirs of the Peabody Academy of Science, 1872, p. 15.

While the essay is interesting and suggestive, the leading idea that hexapodous insects first appeared as winged organisms and not as larval forms, will, we think, be found to have no valid foundation. We should with as much reason derive the acalephs from an ancestral free-swimming medusa, and not from a hydra-like form, or the Amphibia from the tailless rather than the tailed forms, views with which we imagine few zoölogists would agree. — A. S. PACKARD, JR.

ANTHROPOLOGY.

ABORIGINAL (?) GUN-FLINTS. — Among the ancient ruined buildings of Utah and Arizona I picked up two curious objects of stone, the use of which I for some time was unable to determine. At first I supposed them to have been arrow-points or scrapers which had been broken at the points, leaving the square buts, but on careful examination I found that they had each been laboriously chipped on the four edges, and from their general appearance had undoubtedly been used as gun-flints. In order to satisfy myself on this point, I procured a large number of modern flints made by the whites, and on comparison I found that the two from the West resembled them closely in size and shape, only differing in material and in the manner in which they had been flaked. They are from one eighth to one fourth of an inch in thickness, number one being thickest at the lower or striking edge and number two at the upper. The material of number one (by far the finer specimen) is a light gray flint with white and pink water markings. That of number two is a pink agate sprinkled with specks and blotches of red moss. Both of these varieties of stone are found throughout the West, and objects manufactured from them are numerous amongst the ruins. They are not to be found, except in rare cases, if at all, in the eastern portion of the United States, and we may therefore reasonably suppose that the flints were made on the Pacific slope. That such objects of a civilized people should occur among the rude implements of an aboriginal and prehistoric race is somewhat surprising, especially when it has heretofore been supposed that this particular section has not been traversed by whites until the past few years, when the flint-lock has been superseded by the percussion cap. This fact, however, cannot be vouched for, and although we know that no official expeditions have passed over this country, it is possible that hunters or wandering scouts may have visited the ruins of the San Juan Valley. The district in which I found the flints has not been occupied by tribes of Indians for many years, as it is a barren, dry desert, devoid of water (with the exception of the warm San Juan) and almost destitute of grass and wood. It is, indeed, a matter of doubt whether it has been inhabited since the disappearance of the Pueblo race which built and occupied the old houses which have been